

HAIR-PENCILS AND SCENT BRUSHES.

(With Plate II.)

By Rev. DESMOND MURRAY.

The more closely our moths are studied the more evident it becomes that insects generally and Lepidoptera in particular (with allied families) are furnished with elaborate sense organs.

These are variously distributed over different parts of the insect: the wings, legs, thorax and abdomen often hold sensitive cells in great variety. "Probably all the hairs and bristles with which insects' bodies are studded are sensitive to touch and to vibrations; it may be some have senses we cannot appreciate," Malcolm Burr has told us. The late Dr Eltringham, whose death we had to recently lament and who was the recognized authority on this subject, found that a tiny Caddis fly of the genus *Hydroptila* had an elaborate apparatus at the back of the head, comprising sets of scent glands and extensible brushes, protected by folding covers, neatly arranged and packed away under a pair of hinged lids, barely 1/50th of an inch across. (*T.E.S.*, 1919, p. 420.) "One hardly knows which is more marvellous," the same writer says, "the microcosm of nature or the skill and ingenuity of the men who have found, dissected and interpreted such minuteness."

With moths these various kinds of scent organs have so far only been partially studied. Here it is contended that they are of much more frequent occurrence than is generally supposed, that they extend, in fact, to all the families of moths in our lists, from the *Sphingidae* to the *Tineina*, for they are found with all these in one or other of the parts mentioned. Though varying considerably in form, their function must be similar in every case.

A few notes are given here on the Hair-Pencils and Scent Brushes which are found on the abdomen and legs of many of our common moths. It is only the male insect which possesses these organs.

(1) First, to make clear what particular organs we refer to. The Hair-Pencils which are found especially amongst the *Noctuidae* consist of long tufts of specialized scales, on each side of the first segment of the abdomen. Generally they are concealed in a pocket or extensile pouch and therefore are seldom seen. They arise from chitinous sockets and show muscle fibres which must serve to extend the brush from its groove. When expanded they resemble two elaborate fans.

Though previous writers had noticed them, Mr F. N. Pierce drew special attention to their frequent occurrence in the Noctuids. (*Cfr. Genitalia Noct.*, 1909, p. 18.) Amongst the 300 odd species examined some 40 were found to have the Hair-Pencils, which also occur in close proximity to the genital organs, but more generally on the first abdominal segments. Although he recorded their presence in every species in which he actually observed them, his failure to notice them in other species is not to be taken as conclusive evidence of their absence. Eltringham examined and illustrated the Hair-Pencils in the case of two common moths, i.e. *P. meticulosa* and *X. monoglypha (polyodon)* (*T.E.S.*, 1925, p. 1), concluding that they must be for the diffusion of scent. Probably they are never expanded except in flight and perhaps only then in the presence of the female, Eltringham tells us. Two fur-

ther examples are given (Figs. 1 and 2) of *C. absynthii* and *H. lucens*. The first has, in addition, the underside of the cell of the forewing covered with a dense tuft of long setae and prominent tufts on the back of the body. These together no doubt constitute both scent container and distributing brushes. The other example was generally considered a form of *H. nictitans*, though really a distinct species. The latter does not possess the Hair-Pencils. They may then be of some specific value. Similar ones are found in *H. paludis*, *H. crinanensis* and other allied species.

(2) As well as the Hair-Pencils there are extensile sacs known as the *Coremata*. These are similar tufts of specialized scales (often also termed Hair-Pencils) which are sometimes found on the eighth segment on each side of the body, the setae often being spatulate in form. The *Coremata* show very similar structure to the Hair-Pencils proper and must be considered to function in the same way as distributors of scent. This contention is strengthened by the fact that in some tropical species a more elaborate organ is found in the same position, which Eltringham concluded was an organ of scent (*T.E.S.*, 1927, p. 431). The particular species he mentioned was from Trinidad. This and many S. African species have Hair-Pencils on the first and eighth segment as well as Scent Brushes on the legs.

The *Coremata* are distinct from the *Peniculi* on the ninth segment, which are expansions of the *tegumen*, though also in close proximity to the genital organs. Examples of *Coremata* amongst the *Geometridae*, *Pyrilidae*, *Tortricidae*, and the *Tineina* are shown in Figs. 6 to 9 (after Pierce). They vary considerably in size and form.

(3) The Scent Brushes are more generally found on the legs, the male moth only being affected. Recently an example was given in which the brush is found on the foreleg (*Ent. Record*, 54, p. 65); another where the second pair of legs holds a similar organ (Vol. 53, p. 73). This was of *H. derasa*, which is of special interest as its presence had not been previously recorded.

The two examples given here are found on the hind legs, i.e. *Hepialus humuli* and *H. hecta*—Figs. 3, 4 and 5. In the first case the hind leg is normal, except that the tibial spurs are absent, but the femur holds a large tuft of long setae or a Scent Brush. The brush, as in most cases, is on the inner side of the leg, held close to the body. Barrett first noticed that the tibia of *hecta* was aborted into a kind of swollen sac or "a bladdery termination," as he called it, and that this organ gave forth a scent. The last leg joint and foot is absent, or at least so it appears.

The first figure shows the brush in position; the second the tibia denuded of scales, showing the bases or sockets from which the setae spring; the third what appears to be the remains of a foot. There is a small section at the end of the leg which seems to be more chitinized than the rest. What appears to be a minute rudimentary foot can possibly be made out in this area. In some mounts it appears to be more in the centre, though it generally seems to be carried away by the dense scales.

Deegener says the swollen tibia contains the glandular apparatus. (Cfr. *Zeit. Wiss. Zool.*, 1902, p. 276.)

The presence of the Scent Brush in these moths goes to disprove the theory that in the case of the *Hepialidae* the female seeks the male and not *vice versa* (T. E. Robson, *Ent. Record*, Vol. 3, p. 55 seq., 1892). "The male *humuli*," Robson says, "flies in this conspicuous manner that the female may see him and his light colour very greatly assists this." But if the male is using his Scent Brush, while in flight, as a means of finding his partner (as must be supposed) the case is reversed or the female must have some corresponding scent to attract him. Which theory is correct?

The other three species in our fauna do not seem to have a Scent Brush, though probably all moths, as already stated, have one or more in some form or another. It is interesting to find that the flight of these three species is quite different from that of the other two. Robson supposes that in the former cases it is the female which diffuses the scent.

It is only by a closer study of these interesting organs in a variety of insects and by comparison that the problem of their true function can be solved.

EXPLANATION OF PLATE.

Hair-Pencils: Fig. 1. ♂ *Cucullia absynthii*, Linn. × 6. Fig. 2. ♂ *Hydraecia lucens*, Frey. × 12.
 Scent Brushes: Fig. 3. ♂ *Hepialus humuli*, Linn. Hind leg × 12. Fig. 4. ♂ *H. hecta*, Linn. Hind leg and single seta × 12. Fig. 5. Same denuded of setae and rudimentary foot.
 Genitalia showing Coremata (after Pierce): Fig. 6. ♂ *Acidalia imitaria*, Hb. (Geometridae). Fig. 7. ♂ *Diasemia litterata*, Scop. (Pyraustidae). Fig. 8. ♂ *Pandemis heparana*, Schiff. (Tortricidae). Fig. 9. ♂ *Parectopa ononidis*, Z. (Tineina).

MORE ON "AN ARTIST'S NOTE."

By P. SIVITER SMITH.

At the risk of becoming tedious to readers I would like to add a word or two following the very interesting points made by "An Old Book-Maker." The correspondence I have received since the subject was opened makes me think that this discussion that has been running is not without interest to some at any rate.

We are referred now to colour-gravure and collotype. I did omit mention of them because on the whole, for colour work in particular, they are costly on small runs such as are required for scientific publications. My note was not, of course, intended to be a comprehensive review of the various processes—I am hoping sometime in the not too distant future to be able to help to produce within one cover a general outline of all available methods together with other relevant matter, but my previous note was rather sketchy.

I am familiar with the two processes in question. Our friends the Sun Engraving Company have been very successful with photo-gravure, particularly in making the process into one that could be operated commercially on a large scale with consistent results. Whilst it is true to say that gravure need not employ a screen, it is not correct to say that a screen is not used. At the present time a screen is often used;